EXHIBIT 15

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INVESTIGATION

of the

Bryson Crash

RFI#22SC0121

Prepared by

Christopher Roche

October 12, 2023

THE EXPERTS

Robson Forensic

INVESTIGATION OF THE BRYSON CRASH

EXPERT'S REPORT **OCTOBER 12, 2023**

A. INTRODUCTION

This two-vehicle crash occurred on 3/15/2020 at about 11:15pm on GA2 at the intersection with GA5 in Fannin County, Georgia. The collision involved:

- A 2008 Ford Escape driven by Santana Kelley with passengers Joshua Bryson and Cohen Bryson.
- A 2016 Ford F250 Super Duty driven by Hunter Elliott.

As a result of the crash, the rear passenger of the Escape, Cohen Bryson, was fatally injured.

The purpose of this investigation was to determine whether Rough Country's actions or inactions related to the lift kit fitted to the Ford F250 were improper and caused or contributed to the crash severity and the fatal injuries of Cohen Bryson.

B. MATERIALS AVAILABLE FOR REVIEW

- The United States District Court for the Northern District of Georgia Gainesville Division Complaint (Number 2:22-CV-017-RWS)
- Rough Country LLC's Reponses and Objections to Plaintiffs' First Requests for Production
- Rough Country LLC's Reponses and Objections to Plaintiffs' First Requests to Admit
- Rough Country LLC's Reponses and Objections to Plaintiffs' First Interrogatories
- Rough Country LLC's Reponses and Objections to Plaintiffs' Second Requests for Production
- Rough Country LLC's Reponses and Objections to Plaintiffs' Second Requests to Admit
- Rough Country LLC's Reponses and Objections to Plaintiffs' Second Interrogatories
- Rough Country LLC's First Supplemental Response to Plaintiffs' First Requests for Production
- Rough Country LLC's First Supplemental Response to Plaintiffs' First Interrogatories
- Rough Country LLC's Reponses and Objections to Plaintiffs' Second Requests to Admit
- Rough Country LLC's Reponses and Objections to Plaintiffs' Third Interrogatories
- Rough Country Production Bates Stamped RC000001 – RC000467
- Rough Country Production Bates Stamped RC000472 – RC006698
- Transcript of Motion Hearing – Docket Number 2:22-cv-00017-RWS
- Transcript of the Deposition of Rad Hunsley and 14 Exhibits
- Transcript of the Deposition of Joshua Bryson and 4 Exhibits
- Transcript of the Deposition of Santana Kelley and 3 Exhibits
- Transcript of the Deposition of Andrew Phillips and 3 Exhibits
- Fannin County Autopsy Report – 2020-1006710
- Twenty-nine JPG Images from Autopsy
- Fannin County Crash Report (Case Number C000671920-01)
- PDF Document of EDR Download from Ford Escape – Report ID# L196

- PDF Document of Scene Aerial T-425 Photos – Bates Stamped Bryson 000268-363
- PDF Document of Vehicle Inspection – Bates Stamped Bryson 000364-507
- PDF Document of On Scene T-196 Photos - Bates Stamped Bryson 000508-714
- PDF Document of Scene Mosaic Photos - Bates Stamped Bryson 000715-716
- MP4 Video File of Crash Animation 1 – Bates Stamped Bryson 000717
- MP4 Video File of Crash Animation 2 – Bates Stamped Bryson 000718
- TS Video File of 650 Patrol Car at Hospital – Bates Stamped Bryson 000719
- TS Video File of 650 Patrol Car at Scene – Bates Stamped Bryson 000720
- MP4 Video File of Deputy Jim Burrell #362 – Bates Stamped Bryson 000721
- MP4 Video File of Deputy Jim Burrell #362 – Bates Stamped Bryson 000722
- MP4 Video File of Deputy Jim Burrell #362 – Bates Stamped Bryson 000723
- MP4 Video File of Deputy Jim Burrell #362 – Bates Stamped Bryson 000724
- WAV Audio File of Gainesville Communications Center call – Bates Stamped Bryson 000725
- Text File of Gainesville Communications Center call – Bates Stamped Bryson 000726
- Transcript of Gainesville Communications Center call – Bates Stamped Bryson 000727-730
- Georgia Department of Public Safety (GDPS), Specialized Collision Reconstruction Team (SCRT) Report (Case Number" SCRTB-017-20) – Bates Stamped Bryson 000731-925
- Ford Dealership Maintenance Documents – Bates Stamped Ronnie Thompson Ford 000001-000030
- Ford Motor Company and NHTSA Meeting Presentation Dated February 24, 2006
- PDF Document of 2008 Ford Escape Owner's Manual
- PDF Document of 2008 Ford Escape CARFAX Report
- PDF Document of 2016 Ford Super Duty F250 CARFAX Report
- PDF Document of 2016 Ford Super Duty Owner's Manual
- Rough County Order Confirmation – Bates Stamped RC005377
- My inspection of the vehicles on 11/15/2022

C. DESCRIPTION OF THE SITE AND COLLISION

The Police Report States:

Vehicle #2 was stopped in the left westbound lane of GA 2, at its intersection with Blue Ridge Drive. Vehicle #1 was traveling in the left westbound lane of GA 2, approaching vehicle #2 from its rear. Vehicle #1 struck the rear of vehicle #2 with its front portion pushing vehicle #2 west into the intersection of GA 2 and Blue Ridge Drive. (Note that Vehicle #1 was the Ford F250 and #2 the Escape).

The crash diagram from the Police Report is shown in image 1.

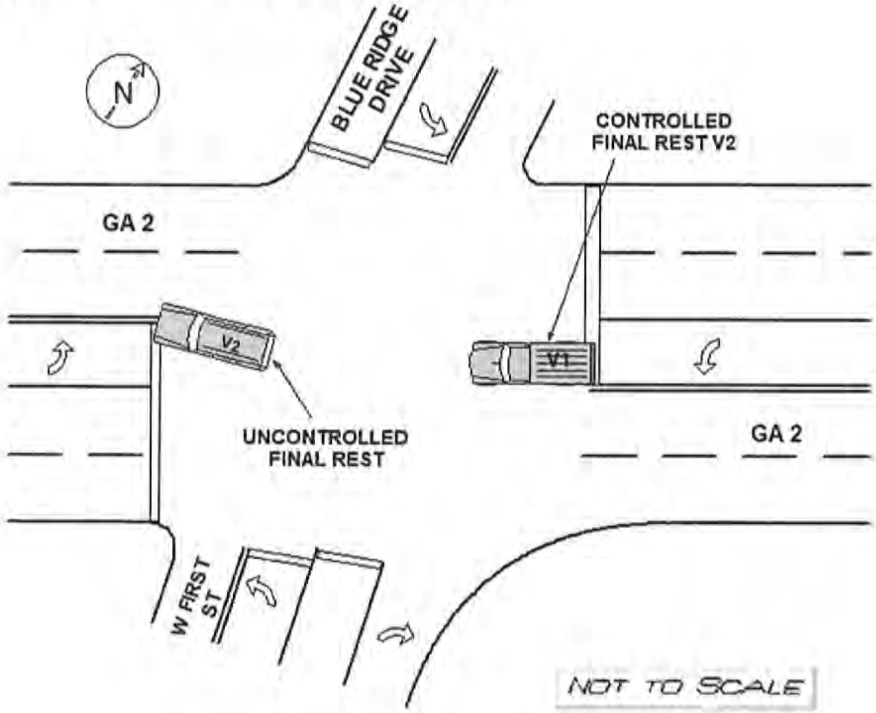

Image 1: Police Report crash diagram

The crash occurred on westbound GA2 at the intersection with GA5 (or Blue Ridge Drive). At the crash site, GA2 is predominantly a 4-lane, asphalt paved roadway that is generally orientated east-west. At the intersection, GA2 has turn lanes in both directions for access to GA5 resulting in 5 lanes locally. There is a double yellow line separating the westbound and eastbound lanes. The intersection has a traffic-control device (traffic light). In both directions there are partial width paved shoulders. At the time of the crash, it was dark but lighted and the road surface condition was dry. The speed limit for GA2 was posted at 45 mph. Image 2 shows a Google Earth image of the crash site as taken on 11/2021.

Image 2: Google Earth image of the Crash Location

D. QUALIFICATIONS

I graduated with a Bachelor of Engineering, Mechanical, from The University of Manchester, England in 1995.

I have 27 years of experience in the design, development, and manufacturing of production vehicles at the Original Equipment Manufacturer (OEM) level. This experience covers most facets of bringing a newly designed automobile from an idea to mass manufacture and sale.

My experience in vehicle design, development, testing, and manufacturing was gained in my roles as a Body CAE Engineer at the Rover Group, Body Structure Engineer at Chrysler, Senior Body Engineer and Body Structure Manager at Hyundai-Kia, CAE Manager at SAIC, Director of Body Engineering at SF Motors and Director of Engineering Programs at Optimal. The new vehicle lines I worked on include the 1998 Rover 75 (R40 platform), 1999 BMW X5 (E53 platform), 2000 Mini (R50 platform), 2002 Range Rover (L322 platform), 2005 Jeep Grand Cherokee (WK platform), 2008 Jeep Liberty (KK platform), 2011 Jeep Grand Cherokee (WK2 platform), 2010 Hyundai Elantra (MD platform), 2013 Hyundai Santa Fe (DM platform), 2021 Hyundai Santa Cruz (NX4a platform), SF Motors SF5 and Optimal S1LF.

During my various assignments in Body Engineering, I was part of groups that were involved in the complete body system development. This included the system level Design, Verification Plan & Report (DVP&R), component part and assembly level detailed design, assembly level Finite Element Analysis (FEA) simulation, system and vehicle level testing, prototype build and testing and production vehicle launch support. These roles covered the complete Body-in-White (BIW), closure systems and exterior trim

components. In many of these roles, I had responsibility to ensure that the body system met the established internal and regulatory structural requirements including all types of crash tests. I studied and documented competitive vehicles with a specific focus on their body systems. This included performing competitive vehicle tear-down reviews and charting body performance and construction, including structural behavior, material composition, and the crashworthiness performance.

In my SAIC CAE manager assignment, I was responsible for the vehicle level FEA to predict the structural and occupant performance in a variety of crash and other structural test modes. This involved modelling all components necessary to accurately simulate full vehicle tests including chassis, powertrain and interior components such as seats and occupant restraints (belts and airbags). Extensive efforts were taken to correlate the FEA models with physical tests.

In my Optimal Director of Engineering Programs assignment, I was responsible for entire vehicle programs. This covered the design and development of all vehicle systems and production processes. One aspect was to establish the vehicle compliance plan and internal safety targets to meet and exceed Federal Motor Vehicle Safety Standards (FMVSS). Additionally, acquiring or developing appropriate design processes and specifications at a vehicle and system level, such as the vehicle durability duty cycle.

My CV outlining my complete education, experience and training is attached separately.

The approach taken for the analysis of this investigation is based on reliable scientific reasoning and methodology which is accepted by the scientific community. My opinions are offered to within reasonable degree of technical certainty relying on automotive and mechanical engineering industry principles and practices. My opinions are subject to change if additional information becomes available.

Terms of Compensation

The professional service fees Robson Forensic, Inc. charges for all tasks that I have undertaken in this case is currently $475 per hour, subject to change. To date Robson Forensic has billed about $23,000 for my work in this matter.

Testimony as an Expert

A document listing each of the occasions on which I have given expert testimony in the past 4 years is attached separately.

Exhibits

I may use the following materials as exhibits to illustrate testimony: all references and documents cited in this report or listed as Materials Available for Review.

E. Background

Elliott's 2016 Ford F250 Super Duty King Ranch was a single rear wheel, crew cab pickup truck with four-wheel drive and a 6.7L diesel engine, VIN 1FT1FT7W2BT9GEC79140. The truck was modified by the fitment of a Rough Country lift kit which increased the ride height of the frame and body of the truck. The front-end damage sustained by the F250 can be seen in Image 3 which shows exterior trim damage to the lower valance and grille and front bumper and hood deformation.

Kelley's 2008 Ford Escape was a small 4-door SUV with two-wheel drive and a 3.0L gasoline engine, VIN 1FMCU03178KA77952. The rear end damage sustained by the Ford Escape can be seen in Image 4 which shows extensive structural deformation of the entire rear end of the vehicle and the rear bumper detached. Image 5 shows the rear passenger compartment with the rear child seat pushed forward into the back of the front driver's seat.

Image 3 – Ford F250 at Car Crafters, Towing Company Facility

Image 4 – Ford Escape at Car Crafters, Towing Company Facility

Image 5 – Ford Escape at Car Crafters, Towing Company Facility

Inspection of the 2016 Ford F250 Super Duty revealed:

- Minimal deformation to the front end of the F250 (Image 6).
- Local deformation to the center of the bumper in a vertical direction. The presence of two Secondary Energy Absorbing Structure (SEAS) brackets showing minimal deformation or contact marks (Images 7 & 8).

- Lack of crush or deformation to the Primary Energy Absorbing Structure (PEAS) or frame rail and no evidence of contact between the SEAS bracket and the frame (Image 9).
- Fitment of a Rough Country suspension lift kit to raise the vehicle's ride height (Image 10).

Inspection of the 2008 Ford Escape revealed:

- The entire rear of the body has been significantly compressed with the D pillar collapsed onto the C pillar and both deformed forward in vehicle, exposing the rear wheels (Image 11).
- The lower rear body structure has been compressed forward in vehicle and both rear rails exposed with the floor panel and lower crossmember deformed forward in vehicle and peeled off from the rails (Images 12, 13 and 14). Neither rail exhibits significant axial collapse with local bending of the members only and the right rail bent downward. The rear bumper beam is detached. The liftgate has deformations either side of the rear window that are consistent with direct contact damage.
- The rear trunk space has been compressed longitudinally and the rear seats deformed forward in vehicle toward the front passenger seats reducing the second-row occupant space (Image 15).

Image 6 – F250 Front End Damage

Image 7 – Bumper Damage & Secondary Energy Absorbing Structure (SEAS)

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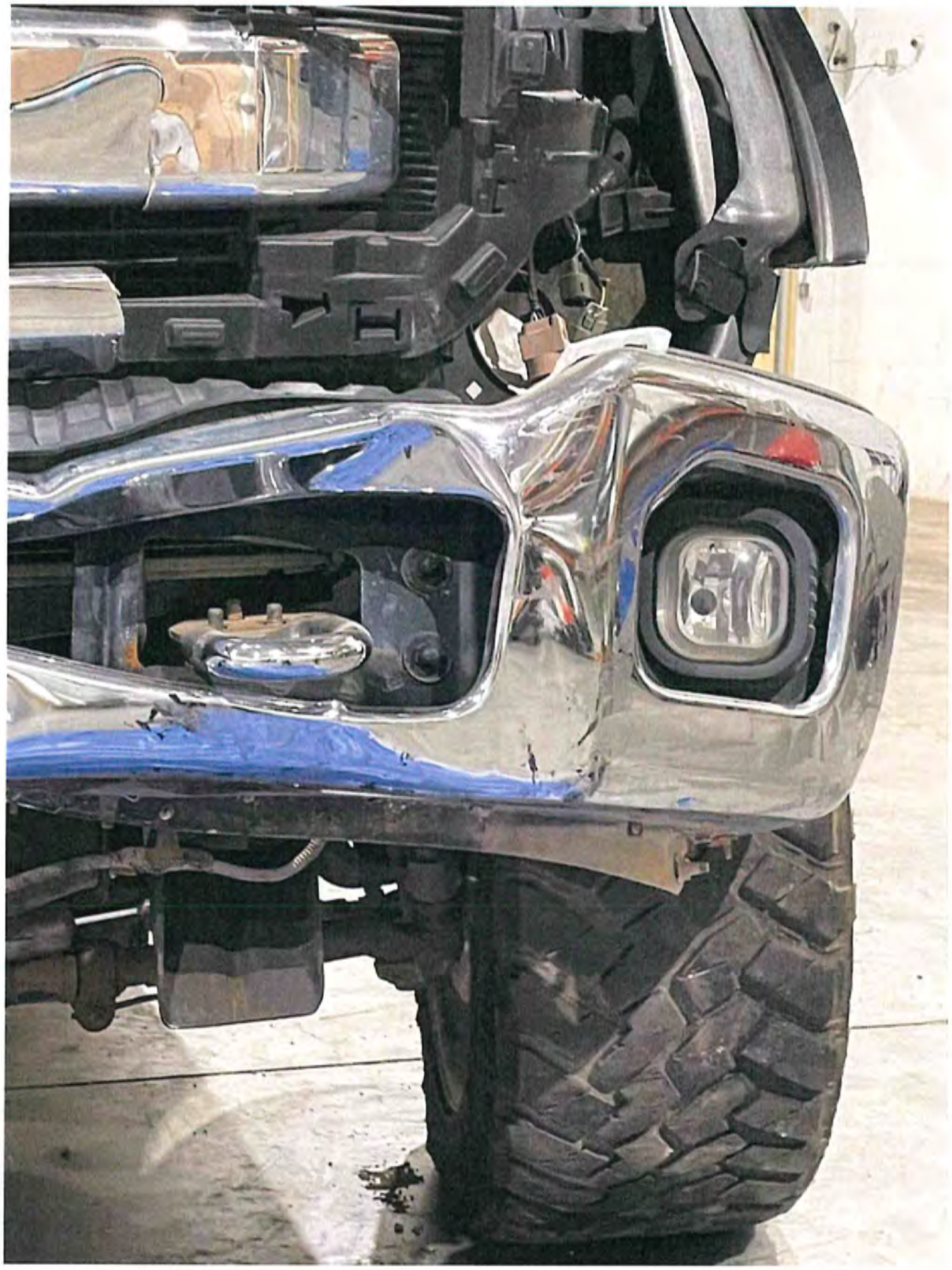

Image 8 – Bumper & Left SEAS

Image 9 – Left Front Frame Rail & SEAS

Image 10 – Rough Country Lift Kit Components

Image 11 – Ford Escape Rear Deformation

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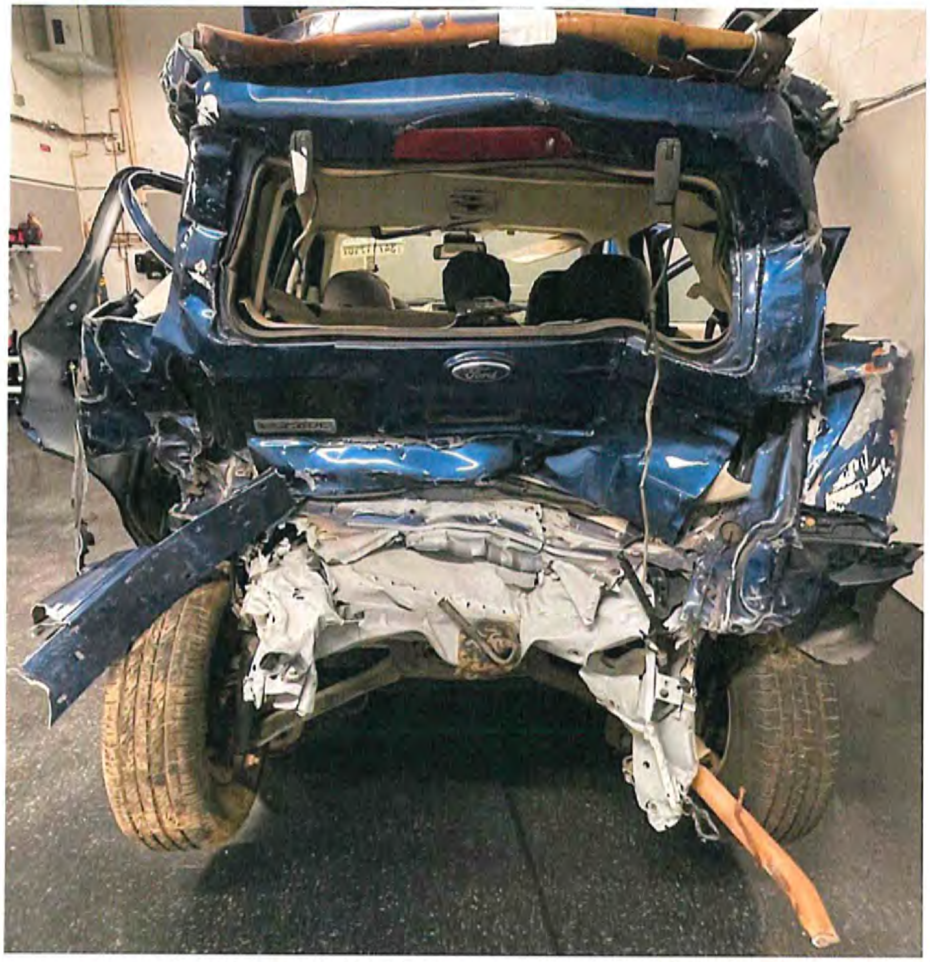

Image 12 – Ford Escape Rear Deformation

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Image 13 – Ford Escape Right Rear Rail

Image 14 – Ford Escape Left Rear Rail

Image 15 – Ford Escape Rear Seats

F. ANALYSIS

Vehicle Crashworthiness

The science of vehicle crashworthiness focuses on the protection of vehicle occupants in a variety of impact modes, including rear events, through employing five fundamental safety principles. These were originally developed by Hugh DeHaven and John Paul Stapp. They are:

1. Maintain the survival space for the occupants
2. Properly restrain the occupants throughout the entire crash event
3. Prevent occupant ejection from the vehicle
4. Manage and effectively distribute the crash energy
5. Ensure that there is no fire during or after the crash

Modern vehicle body and chassis structures are engineered to absorb and distribute impact forces and energy away from the occupants. The absorbed impact energy reduces the forces and accelerations subjected to the occupants and the interior survival space is maintained by preventing excessive vehicle body structural collapse.

Vehicle Compatibility

During the 1970s, there began a growing concern within The National Highway Traffic Safety Administration (NHTSA) regarding the vehicle crash compatibility[1] of small passenger cars with light trucks and vans (LTVs). The compatibility was influenced by the relative height of the structural components, the mass, and the stiffness of the impacting vehicle. NHTSA identifies light vehicles as those with a gross vehicle weight rating (GVWR) of 10,000 lbs. or less. This includes passenger cars and LTVs. NHTSA identified that sales of LTVs were steadily increasing as a percentage of light vehicle sales and had reached 50% by 2001. Additionally, they identified that increasing numbers of LTVs resulted in an increase in fatalities for passenger vehicle occupants involved in a collision with an LTV – see figure 1.

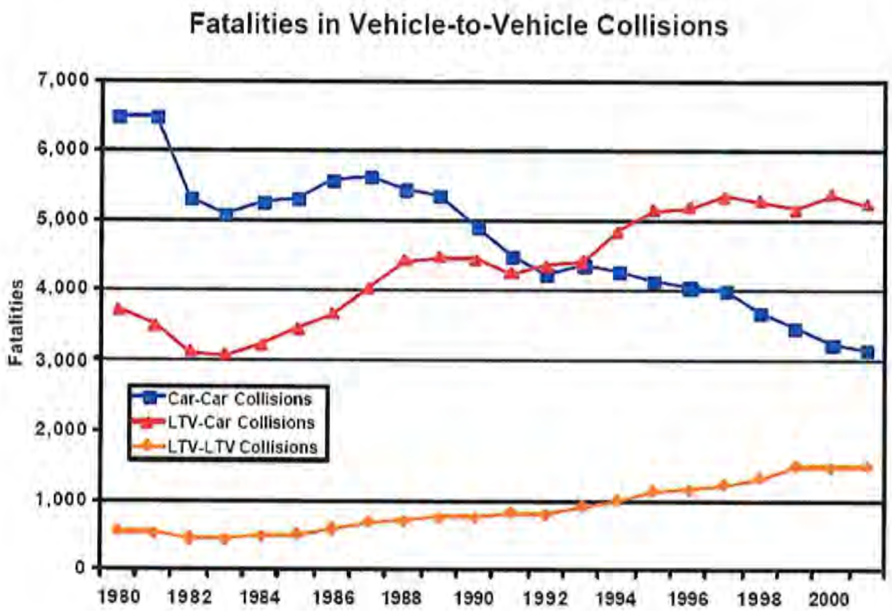

Figure 1 – Occupant Fatalities in 2-vehicle crashes

One specific example of compatibility is the relative height of the primary energy absorbing structures of the colliding vehicles as shown in image 16. Here the higher front frame rail of the LTV on the right is seen overriding the lower front rail of the passenger car on the left. The passenger car's bumper and rail height is primarily determined by the code of federal regulations 49 CFR Part 581 which specifies the requirements for the impact resistance to low-speed front and rear collisions. The regulation requires testing to be conducted at heights between 16 to 20 inches from the ground and so vehicle manufacturers develop bumper beam and primary energy absorbing structures (PEAS) in this height range. Most LTVs

[1] NHTSA. 2003. Initiatives to Address Vehicle Compatibility.

are exempt from meeting Part 581 and so their bumper and PEAS heights are not regulated, and manufacturers are not confined to placing them within the 16 to 20 inch window.

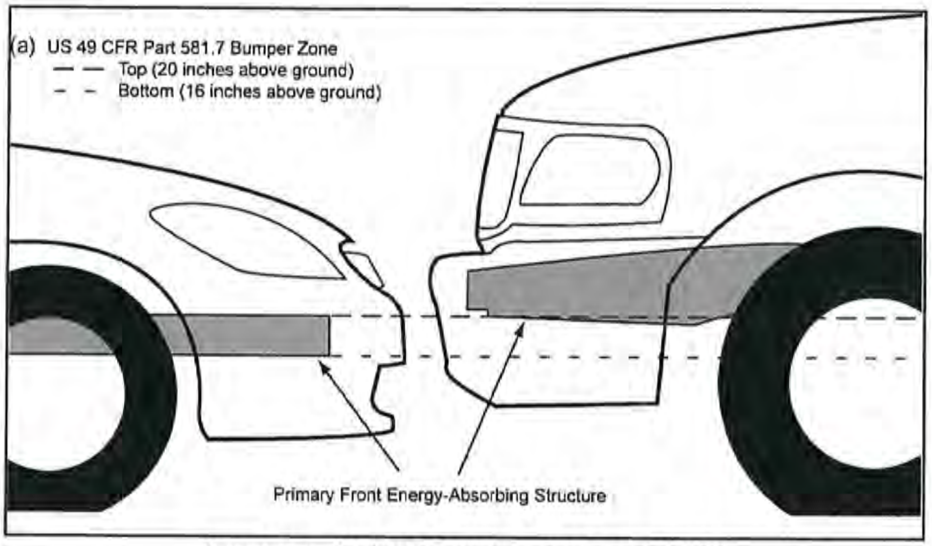

Image 16 – Vehicle Structure Incompatibility

A variety of studies were conducted and led to the establishment of the Enhancing Vehicle-to-Vehicle Crash Compatibility Agreement (EVC) in 2003[2]. Original Equipment Manufacturers (OEMs) agreed to voluntary measures to reduce the height mismatches between LTVs and passenger cars with full adherence for all LTVs built after September 2009. There are two options to improve compatibility: Option 1 specifies that at least 50 percent of the LTVs' PEAS should overlap at least 50 percent of the Part 581 bumper zone of the car, which is located 16 to 20 inches from the ground and runs the full width of the car. If option 1 cannot be satisfied, then Option 2 requires the addition of a Secondary Energy Absorbing Structure (SEAS) with a lower edge no higher than the bottom of the car bumper zone (at 16 inches from ground) as shown in image 17. The SEAS structure should be capable of withstanding a load of 100 kN or greater.

Although the focus of the EVC was to improve vehicle compatibility between cars and LTVs in front to front or front to side impacts, the basic structural alignment principles also apply and are relevant to front to rear impacts. In a front to rear impact often the biggest risk for the occupants in the vehicle being rear ended is fuel fires, where a rear mounted fuel tank is ruptured during the event. The Federal Motor Vehicle Safety Standard (FMVSS) test 301 requires fuel tank integrity to be maintained during a high-speed rear impact. This ensures that OEMs sufficiently reinforce the rear underbody structure to protect the fuel tank. Part 581 applies to the rear bumper as well as the front and passenger cars must have the rear bumper in the 16 to 20 inch window. The EVC compatibility guidelines to improve car to LTV structural

[2] NHTSA. 2012. Evaluation of the Enhancing Vehicle-to-Vehicle Crash Compatibility Agreement: Effectiveness of the Primary and Secondary Energy-Absorbing Structures on Pickup Trucks and SUVs. DOT HS 811 621.

interaction are relevant and an LTV designed to meet the EVC agreement will be more compatible when rear impacting other vehicles due to the primary energy absorbing members being in alignment vertically.

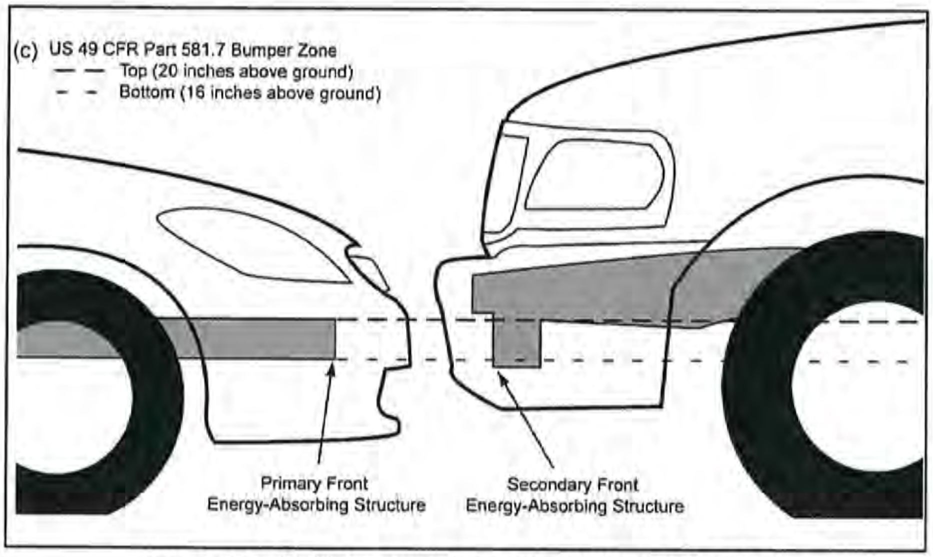

Image 17 – Vehicle Structure compatibility with a SEAS

Vehicle Compatibility Strategies

A technical working group[3] formed to study vehicle compatibility performed both physical crash tests and Finite Element Analysis (FEA) simulation to develop test procedures and performance metrics. They assessed structural enablers to enhance vehicle compatibility whilst not degrading the crash performance of the LTV itself. Physical tests were performed on a large pickup truck without a SEAS and an F250 pickup truck fitted with a SEAS. Additionally, FEA was used to evaluate the effectiveness of SEAS structures and quantified their energy absorption characteristics. Image 18 shows an FEA result with the SEAS being two brackets (shown in red) attached to the PEAS (shown in blue). The SEAS brackets hang down far enough within the Part 581 zone, so that they engage with the rigid wall and in turn deform the PEAS of the LTV. This results in energy absorption in the LTV front structure as the PEAS is now loaded effectively and also ensures engagement with the bumper and rail structure of the passenger vehicle, reducing the potential for override.

The two brackets fitted to Elliott's Ford F250 are very similar in appearance to those being studied by the working group and were factory installed (part number AC3Z5C002A). Ford fitted the brackets to satisfy option 2 of the EVC, to provide a secondary energy absorbing structure.

[3] Barbat, Saeed. Status of Enhanced Front-to-Front Vehicle Compatibility Technical Working Group Research and Commitments. Paper No. 05-463.

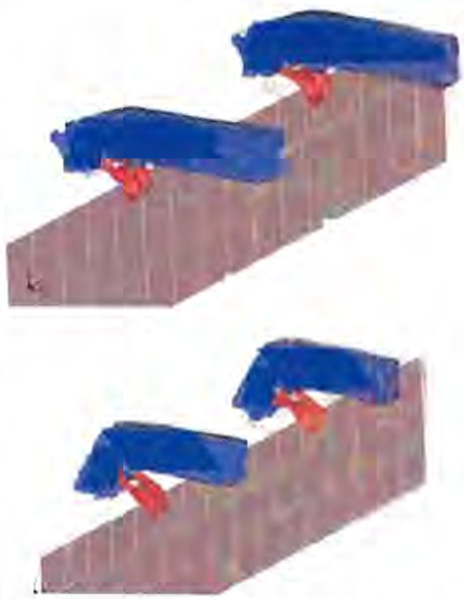

Image 18 – FEA of a frame rail with SEAS impacting a rigid wall

An IIHS study[4] in 2011 to analyze the effectiveness of the EVC found that "it is likely that a large factor in the reduced aggressivity of light trucks is the increased adherence with the EVC compatibility design guidelines".

Ford Escape Design and Rear Impact Performance

The 2008 Escape utilized unibody construction rather than the body on frame (BoF) design of the F250. A unibody does not separate the primary underbody structural members from the rest of the body in contrast to the traditional ladder frame and separate cab and bed body structures of most pickup trucks. The 2008 Escape was developed off Ford's CD2 platform which was based on partner Mazda's GF passenger car platform for cars such as the 626. The Escape's rails were fully welded and integrated to the rear and center floor pans as seen in Image 19. A 2008 Ford Escape was tested for compliance to meet the Federal Motor Vehicle Safety Standard (FMVSS) 301 for fuel system integrity. The test used a moving deformable barrier (MDB) that weighed 3006 pounds and struck the stationary Escape at 49.6mph with a 70% overlap biased to the left side of the vehicle. The post-test condition (Image 20) of the Escape shows considerable deformation rearward of the C pillar. However, most of the impact force was below the vehicle beltline and the rear underbody and rail structure was directly loaded by the barrier. This structure was effective in absorbing energy in the test and preventing deformation and intrusion into the passenger compartment.

[4] Teoh, Eric & Nolan, Joseph. 2011. IIHS. Is Passenger Vehicle Incompatibility Still a Problem?

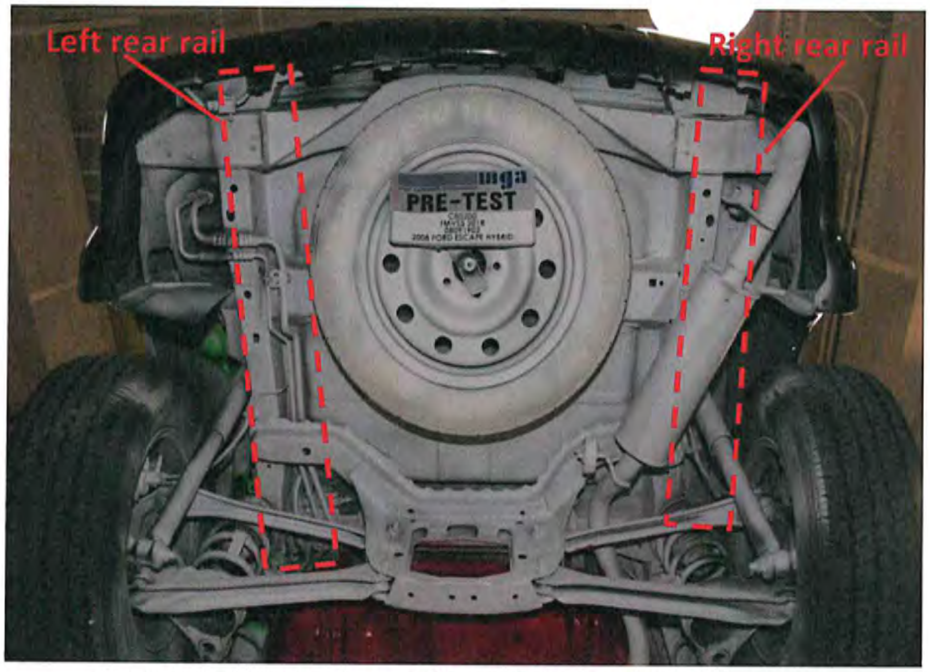

Image 19 – FEA of a frame rail with SEAS impacting a rigid wall

Image 20 – 2008 Ford Escape post FMVSS 301 Test

Typical mass produced unibody structures in 2008 and through to today utilize a variety of steel grades of varying strength that are optimized to provide the required occupant safety outlined previously. Image 21 shows the steel grades utilized on the 2013 Escape. It can be noted that the higher strength steel is

primarily used in the front and around the occupant compartment up to the C pillars. The rear upper structure and floor uses the lowest strength steel (mild) and only the rear rails employ a higher strength steel (in this case 600MPa UTS steel). The 2008 Escape will have employed a similar but more basic material strength strategy but one that was effective in meeting the rear compliance test requirements. Based on my education and experience, the 2013 Escape material utilization was typical for a 2-row vehicle with higher grade steel utilized in the rear rail and lower strength utilized in the rear upper structure and is foreseeable in the automotive industry.

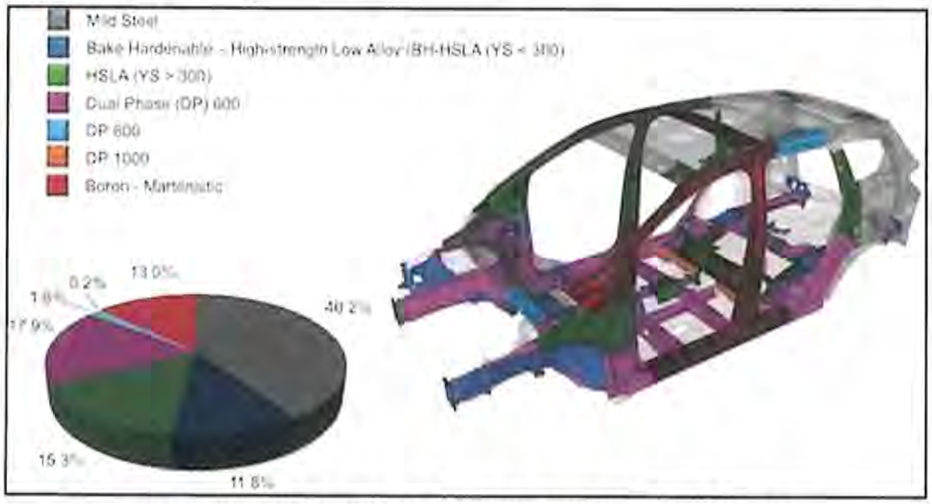

Image 21 – 2013 Ford Escape Body Structure Steel Grades

Rough Country Suspension Lift Kits

Rough Country (RC) specializes in selling parts and components to allow customization of standard vehicles including pickup trucks. RC currently produces lift kits designed to fit 2016 Ford F250s that provide increased ride heights from 3 to 6 inches. The RC 4.5 inch lift kit for a 2016 Ford Super Duty is shown in image 22. RC claims that their "easy-to-install lift kit raises the front of your vehicle to be equal height with the rear for a leveled, better-than-stock look that gives an improved ride height and more aggressive appearance". RC claims that their kits are designed to "keep everything at optimum angles for a factory-like ride, even after lifting". There is nothing in the kits that enables a lifted truck to maintain compliance with the EVC, nor does RC explain or state (on their website or in the installation manuals) that the fitment of the kit could render the existing truck's safety features ineffective or less effective. RC only directs customers to check local state compliance via a website.

Image 22 – 4.5 inch Lift Kit for a 2016 Ford Super Duty

Elliott's F250 was fitted with RC item 567.20, a 4.5-inch lift kit. In the installation instructions, Rough Country states that the "*suspension system was developed for 35x12.5x17 tire*". Elliott's F250 was fitted with 325/50R22 tires. These tires have an overall diameter of 34.8 inches and width of 12.8 inches – providing very similar overall dimensions to those specified by Rough Country.

Elliott's F250 frame height from ground was measured during the inspection and then corrected for the flat tire and occupant weight using NHTSA compliance test data. This resulted in the bottom of the frame rail (PEAS) being about 24 inches from the ground, exceeding the upper 20-inch limit of the Part 581 bumper region. The height of the bottom of the SEAS bracket was about 18 inches from the ground – no longer meeting the requirement of the EVC that the SEAS should have a lower edge no higher than the lower 16-inch limit of the Part 581 bumper region. A standard, non-lifted 2016 F250 frame rail overlaps the Part 581 bumper region, and the SEAS bracket is about 13 inches from the ground. **The Rough Country lift kit fitted to Elliott's F250 made it non-compliant with the EVC.**

Given the high rate of fatalities on the road and the potential for aftermarket systems to affect the OEM safety systems, it is reasonable to expect a vehicle accessory manufacturer such as Rough Country to identify any potential risks, hazards, and dangers to the occupants of the vehicles once modified and to the occupants of other road users by the modified vehicles. Thus, Rough County should have conducted a thorough Engineering Safety Analysis. This should have included:

- Eliminating the risk, hazard or danger
- Guarding against the risk, hazard or danger
- Warning about the risk, hazard or danger if eliminating or guarding is not possible

Any manufacturer of aftermarket parts should be expected to implement proper Safety Analysis techniques during their product development process and that all potential failure modes and hazards from an individual component level all the way up to the modified vehicle level should have been identified and either eliminated, guarded, or warned about. Many techniques and processes have been developed to assist engineering teams in conducting a Safety Analysis. A common method utilized in the automotive industry is the Design Failure Mode and Effect Analysis (DFMEA).

Rough Country have so far provided no evidence that such a safety analysis was conducted on the 4.5 inch lift kit for the Ford F250. Rough Country should have conducted such a safety analysis and considered the effect of the lift kit on the safety of the F250 for both the vehicle occupants and for other road users. Had they done so and had they identified the risks that incompatibility could create, then Rough Country would have identified a need to produce a new SEAS to provide compatibility with the vehicle lifted.

Vehicle restraint systems such as the driver airbag are designed to deploy in the event of an impact of a specified severity. The system relies on forward mounted sensors that are calibrated based on the front-end stiffness characteristics for foreseeable crash events.

The modification of the front structure, including SEAS, can affect the restraint system performance. In the 2005 F250 owner's manual, Ford warns that "*removing the blocker beam without installing snow plow attachment hardware may affect air bag deployment in a crash*". The blocker beam was a type of SEAS fitted for vehicle compatibility.

Raising the ride height of the truck without providing a modified front structure to compensate could affect the front-end stiffness in a crash and therefore affect the airbag deployment command. The Delta-V recorded by Elliott's F250's EDR was about 18mph, and the driver airbag did not deploy. This despite known deployment thresholds[5] indicating that at 18mph, the probability of deployment was 80%.

Ford Motor Company does not recommend the fitment of lift kits to their trucks, the 2016 Ford F250 handbook warned owners as follows (page 164) "The suspension and steering systems on your vehicle have been designed and tested to provide predictable performance whether loaded or empty. For this reason, we strongly recommend that you do not make modifications such as adding or removing parts (i.e., lift kits or stabilizer bars) or by using replacement parts not equivalent to the original factory equipment."

The increased risk posed by LTVs and their geometric incompatibility with other vehicles has been addressed by OEMs through meeting the EVC by fitting compatibility features. Rough Country produced a lift kit that invalidated the safety systems engineered by the OEM to address this risk and made Elliott's F250 incompatible with smaller vehicles. Rough Country provided no warning to the owner or components to ensure that compatibility was maintained with the lift kit fitted. **With the vehicle lifted, a**

[5] Wood, Earnhart, Kennett. 2014. SAE 2014-01-0496. Airbag Deployment Thresholds from Analysis of the NASS EDR Database.

hazardous condition was created. The use of the incompatible vehicle on public roads resulted in a dangerous condition.

Image 23 shows the comparison of the alignment of the Escape's rear bumper and the front of an F250 in both a nominal condition and in the crash condition using FMVSS 301 test data for the bumper heights with load. According to the Event Data Recorder (EDR) download from Elliott's truck, he was still on the accelerator pedal and not on the brake all the way up to 0.5 sec prior to the airbag deployment. Only between 0.5 and 0 sec did he apply the service brakes. With little braking prior to impact, there would have been minimal weight transfer to the front axle and minimal dive of the front end of the truck, which would have lowered the bumper height. In the crash state, the lower lip of the F250's bumper is higher than top of the Escape's bumper facilitating the override of the Escape's bumper and rear rail structure. Image 24 shows the crash condition alignment with the top of the F250's hood almost level with the top of the Escape's liftgate window.

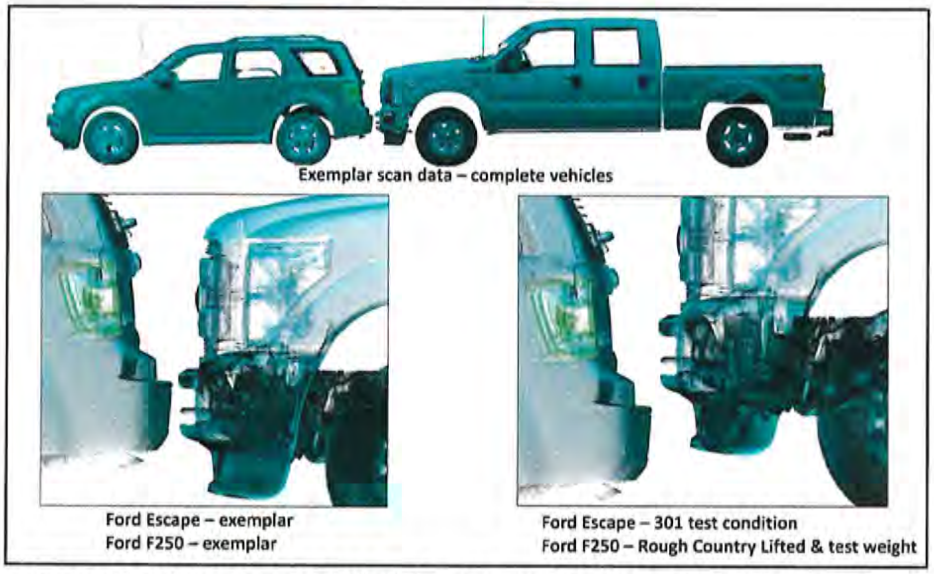

Image 23 – Comparing Vehicle Alignment in Standard and Crash Conditions

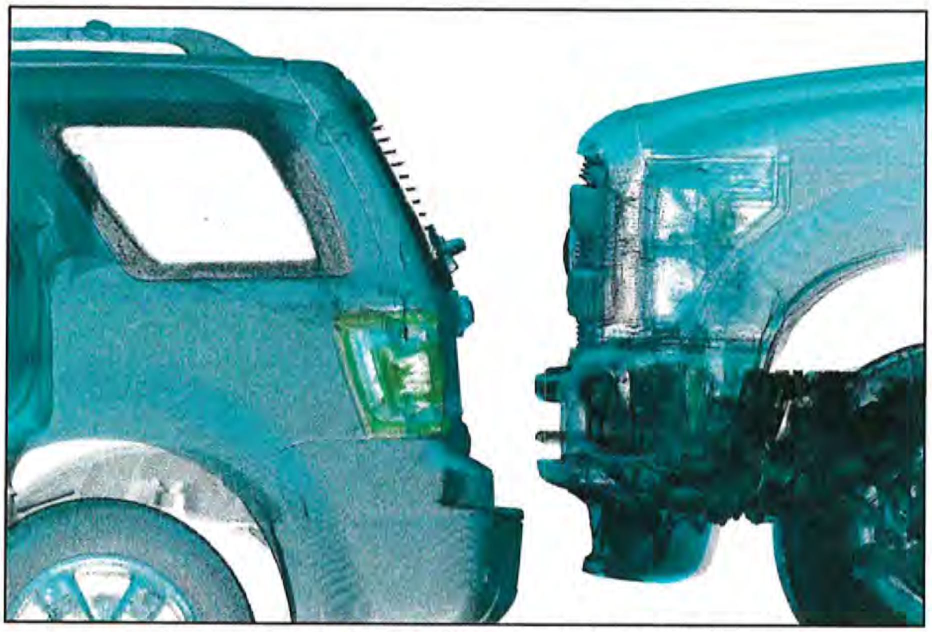

Image 24 – Lifted F250 alignment to the Ford Escape

The increased ride height of Elliott's F250 allowed the bumper and front-end structure to override the rear structure of Kelley's Escape bypassing the rear bumper and rails that should have engaged the F250. **The lifted F250 loaded only the weaker body structure above the bumper and rails, causing increased intrusions and reduced the amount of energy absorbed by the Escape's underbody structure which significantly increased the risk of injury to the occupants.** If the crash had occurred with a regular, non-lifted F250 with sufficient compatibility, as shown in image 23, then the risk of intrusion into the occupant survival space would have been reduced.

As LTV sales have steadily increased and the risks associated with incompatibility of LTVs and other vehicle types has been studied by regulators and OEMs, a standard of care that improved LTV design and provided less risk to other road users was developed. The EVC agreement has been successful in ensuring reduced fatalities of occupants in vehicles that collide with LTVs since it was introduced in 2003. Ford and other OEMs continue to fit LTVs with SEAS, including the current generation of Ford Super Duty – see Image 25. **Rough Country violated the standard of care for LTV compatibility by providing lift kits that rendered the OEM's compatibility designs ineffective, without warning the owner of the vehicle or providing a way to maintain the vehicle's compatibility with the lift kit.**

Image 25 – 2022 Ford F350 SEAS Bracket & Frame Rail

Image 26 – 2016 Ford F250 SEAS Brackets

The SEAS brackets fitted to the 2016 Ford F250 (image 26) are relatively simple, stamped U-shaped brackets that are bolted to the main frame rail in two locations each. Each bracket costs about $25 when

purchased from a Ford dealer as a replacement part. Rough Country could have developed components to maintain vehicle compatibility and could have advised customers to fit the new components when using a lifted vehicle on public roadways. Rough Country has the capability to design and produce new versions of the U-shaped brackets with modified geometry to account for the ride height increase of the lift kit and to ensure it satisfied the 16 inch height and 100 kN load requirement of the EVC agreement. The SEAS brackets are bolted to the frame rail and so removing and replacing them with new components is straight forward and consistent with how the lift kit is installed. The alternative design of new SEAS brackets would not affect the utility of the vehicle on-road and could be easily removed for off-road use, if necessary.

Rough Country specializes in providing aftermarket products for a variety of LTVs. To develop the lift kit systems, RC must have sufficient knowledge of the vehicle being modified to develop the array of components necessary for a lift kit to be fitted and perform adequately. Rough County should know about the safety systems and components that have been fitted by the OEM and they should be developing lift kits that do not invalidate these systems. **Rough Country should have known that by producing lift kits for the Ford F250 and allowing customers to install them for roadway usage, the modified vehicle would no longer provide vehicle compatibility to other vehicles and created a significant risk to other road users.**

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G. FINDINGS

Within the bounds of reasonable professional certainty, and subject to change if additional information becomes available, it is my professional opinion that:

1. The Rough Country lift kit fitted to Elliott's F250 made it non-compliant with the EVC.
2. With the vehicle lifted, a hazardous condition was created. The use of the incompatible vehicle on public roads resulted in a dangerous condition.
3. The lifted F250 loaded only the weaker body structure above the bumper and rails, causing increased intrusions and reduced the amount of energy absorbed by the Escape's underbody structure which significantly increased the risk of injury to the occupants.
4. Rough Country violated the standard of care for LTV compatibility by providing lift kits that rendered the OEM's compatibility designs ineffective, without warning the owner of the vehicle or providing a way to maintain the vehicle's compatibility with the lift kit.
5. Rough Country should have known that by producing lift kits for the Ford F250 and allowing customers to install them for roadway usage, the modified vehicle would no longer provide vehicle compatibility to other vehicles and created a significant risk to other road users.

Christopher Roche

THE EXPERTS
Robson Forensic

CHRISTOPHER D. ROCHE
Mechanical/Automotive Engineer

Motor Vehicle Design, Development and Testing: from requirements, concept through validation field-testing of complete vehicles (Internal Combustion Engine and Battery Electric Vehicles), including manufacturing. Passenger cars, light trucks, commercial vehicles including class 2 to 5 cutaway chassis and shuttle buses. Finite Element Analysis (FEA) for structural performance including crash, durability, and Noise Vibration and Harshness (NVH) performance. Failure Mode Effects Analysis (FMEA) for products and process, Design Verification Plan and Report (DVPandR) and specification development, as well as writing repair procedures. Testing pre-production and production vehicles in extreme environments at or above rated capabilities. Federal Motor Vehicle Safety Standard (FMVSS) and other regulatory requirement compliance.

Motor Vehicle System Design, Development and Testing: body structure; front end modules (FEM); closures structure; door hardware; exterior trim; bumper systems; chassis structure; sunroof system; crash energy absorbing structure (front and rear); seat belt and child restraint anchors; luggage retention; side impact; static door retention; airbag sensing; roof crush; fuel or energy system integrity; anti-corrosion; Transfer Path Analysis (TPA); NVH treatment; structural joint (rigid and isolated) definition and compliance. Finite Element Analysis (FEA) for structural performance at a component and system level including processes and methods to achieve model correlation.

Motor Vehicle Failures: structural; seat belt; seat retention; suspension; fatigue durability; local strength; water leak; wind noise; corrosion; latch operation; side impact injury; crash beams; door slam; head impact; roof crush and dynamic rollover and door retention.

Motor Vehicle Repair: diagnosis and/or repair of body and bumper system, closures, window systems, water sealing, door latches, primary and supplemental restraint systems, lighting, interior/exterior components and systems, interaction of dealers and manufacturers, and safety recall repairs. Proper use of service repair tools and equipment, repair procedures and shop operations.

Manufacturing Process and Equipment: stamping; hot forming; roll forming; extrusion; casting; injection molding; vacuum forming; resin transfer molding (RTM); additive manufacturing processes; pneumatic and DC powered tools, hand tools, torque verification means and methods, fit and finish control, statistical process control (SPC), forming simulation, body-in-white (BIW) structural assembly, adhesives; welding (TIG/MIG/RSW), joining (FDS, SPR), machining, mistake and error proofing, poka-yoke, Advanced Product Quality Planning (APQP), operator protection means and methods and operator ergonomics.

THE EXPERTS Robson Forensic

CHRISTOPHER D. ROCHE
Mechanical/Automotive Engineer

PROFESSIONAL EXPERIENCE

2022 to Present **Robson Forensic, Inc.**
Associate
Provide technical investigations, analysis, reports, and testimony toward the resolution of commercial and personal injury litigation involving vehicle collisions, vehicle crashworthiness and engineering issues, mechanical defects and malfunctions, and vehicle repair issues for passenger cars, light trucks, SUVs, and medium trucks.

2021 to 2022 **Automotive Insight**
Independent Contractor/*Program Manager*

- BEV supply chain development for startups and EV component business development for various suppliers (Automotive Insight).
- Body system and vehicle safety strategy for a BEV startup (Yeager Mobility).

2017 to 2021 **Optimal**
Director of Engineering Programs

- Concept development leader for a low floor electric bus. Managed a team of engineers to develop a BEV based on a commercially available cutaway chassis. Use of FEA to develop the design to maintain the baseline vehicle crash performance for both structural and occupant performance. A mixed material solution comprising high strength steel and reinforced plastics.
- Lead inventor on a patent application for a low floor electric vehicle platform.
- Chief engineer and PM for the Bollinger Motors B1 project (off-road BEV). Responsibilities included developing program targets, including safety performance at a vehicle and system level. Managed a team of engineers to develop the body, chassis, interior, and powertrain systems. Use of CAD, FEA, and PLM to design and develop the vehicle and maintain the BOM. Extensive benchmarking conducted to establish vehicle attribute targets such as steering and brake feel as well as aerodynamic, NVH and KandC performance.
- Managed the development of a test procedure for vehicle durability performance testing including the choice of PG, the types and frequency of events and number of test cycles. Procedures developed for an off-road BEV and class 4 bus.

2017 **SF Motors**
Director of Body Engineering
Responsible for building a team to develop a brand-new body architecture for an EV in the U.S. and China markets.

THE EXPERTS
Robson Forensic

CHRISTOPHER D. ROCHE
Mechanical/Automotive Engineer

2013 to 2017 **Hyundai-Kia Technical Center**
Body Structure Manager

- Manager of the body structure team responsible for RandD activities, production vehicle lifecycle management and product development.
- Led the BIW development of a unibody pickup (Santa Cruz) during concept to prototype release phase. Styling feasibility, master section development, specification development and BIW CAD definition to meet program requirements.
- Managed a small team and actively participated in multiple BIW RandD projects such as optimizing the of rear body side assembly to reduce cost and mass with performance maintained. Utilized structural FEA using topology optimization techniques to re-define the major BIW load paths. Developed new CAD geometry.
- Managed a project to develop a new front apron assembly that included the front longitudinal to reduce cost and mass with no loss in structural performance. Working with the steel supplier, a new forming process and AHSS was utilized. Section development, CAD, FEA, and prototype builds were all undertaken. Full vehicle prototypes were developed, and full vehicle crash tests undertaken to verify performance.
- Responsible for a team that developed BIW countermeasures to improve the IIHS small overlap impact performance of a compact car. The focus was on the front bumper, longitudinal, hinge pillar and side sill reinforcement. BIW CAD of a variety of design concepts was developed that were subsequently analyzed using FEA methods to predict structural intrusion performance. The final design improved the structural rating from "Marginal" to "Good". The team was successful in patenting the structural enablers.
- Supported three manufacturing facilities and seven vehicle products to resolve BIW quality issues, including addressing IQS / VDS issues.
- Recipient of the HATCI President's award in 2015 for exceptional contribution

2010 to 2013 **Roche Engineering**
Owner/CAE Manager
Deployed at SAIC (UK) via contract through Roche Engineering

- Manager of the CAE team responsible for crash, durability and NVH vehicle analysis developing body, interior, and chassis systems to meet program targets.
- Responsible for personnel resource, hardware, software, and CAE strategy including a team of Shanghai based CAE engineers.
- Responsible for all CAE activities related to a new architecture development that was intended to support three vehicle derivatives. Investigated and utilized new CAE methods to explore the design space such as topology optimization and the SFE Concept design tool that allows for major design parameters and can automatically generate the FEA input deck. Process included multi-disciplinary optimization (MDO) routine to find the optimum design variables to meet structural performance targets while minimizing the BIW mass.
- Led the development of a vehicle NVH modal map for body, trim, seats, and chassis systems.

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CHRISTOPHER D. ROCHE
Mechanical/Automotive Engineer

- Managed the CAE team performing the simulation and provided the interpretation of vehicle crash CAE results to develop a European derivative of a mid-size passenger car (2012 MG6) to meet European regulations and the EuroNCAP targets with a revised and larger diesel powertrain.

2008 to 2010 **Hyundai-Kia Technical Center**
Senior Body Engineer

- Designed the rear door structure for the all-new 2010 Hyundai Elantra meeting revised FMVSS 214 side impact requirements: responsible through digital design phases, prototype testing lots, pre-launch, and mass production.
- Co-authored a technical paper on front longitudinal system development and optimization utilizing section analysis tools and sub-system FEA modeling techniques.
- Designed and released all structural body parts and assemblies for the refreshed 2010 Hyundai Santa Fe meeting new IIHS bumper test requirements. Responsible through digital design phases, prototype testing lots, pre-launch, and mass production.
- Designed and developed structural enablers to meet new FMVSS 214, 216a and IIHS roof crush ("Good") requirements whilst minimizing cost and weight penalties. Investigated steel based solutions as well as composite designs utilizing structural adhesives.

1999 to 2007 **Incat Systems, Inc.**
Lead Body Structure Engineer *2000-2007*
Worked at Jeep (Daimler Chrysler) via Contract through Incat Systems, Inc.

- Managed a team of engineers with responsibility for the entire BIW structural performance of the 2010 Jeep Grand Cherokee to meet stringent crash, NVH and durability requirements. Collaborated with BIW, CAE, manufacturing, testing, and other teams to develop the system to meet all structural targets: responsible through digital design phases and prototype testing lots.
- Lead structural engineer for the upper body development for the 2008 Dodge Nitro and 2008 Jeep Liberty to meet crash, durability and NVH requirements. Authored multiple compliance reports (207/210, 214 etc.) and supported launch with a focus on spot weld quality and compliance to internal standards.
- Structural engineer responsible for the 2005 Jeep Grand Cherokee front-end structure. Responsible for the development of the front longitudinal sub-system to meet FMVSS requirements and NCAP and IIHS targets. Responsible for the first IFS shock tower structure for a Jeep Grand Cherokee whilst maintaining industry leading off-road durability performance. Released weld and structural adhesive layouts including weld patterns. Ensured the BIW system satisfied all requirements through each program phase including digital design phases, prototype testing lots, pre-launch, and mass production.
- Ensured full FMVSS compliance for seat belt anchorage (207/210), door crush (214) and roof crush (216) for the 2005 Grand Cherokee and Commander.
- Provided structural engineering support during WK launch at the assy. plant including managing weld destruct activities to ensure compliant weld quality.

Body Structure and CAE Engineer *1999-2000*

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CHRISTOPHER D. ROCHE
Mechanical/Automotive Engineer

- Structural engineer on a Jeep body-on-frame SUV that included performing FEA to meet front impact compatibility requirements.
- Provided CAD design support on 2003 Dodge Viper including virtual build for interference and clash detection of parts.
- Performed FEA on a variety of projects, including wing mirror modal analysis, intake manifold modal analysis and jet ski seat peak loading.

1995 to 1998 **Rover Group/Land Rover (BMW)**
Body CAE Engineer

- Developed a non-linear durability analysis methodology using Abaqus FEA tool that became a standard process. It included non-linear material and geometry capability as well as contact modelling. Methods were correlated against strain gauge data provided from testing. Developed a process manual and provided training to colleagues.
- Performed NVH, durability and local strength FEA simulations on various BIWs and sub-systems for the 1998 Rover 75, 2001 Mini and 2001 Range Rover. Assisted in the resolution of durability issues, such as developing a modified suspension to BIW mounting plate with better load distribution.
- Completed a six-month secondment to BMW in Germany to support the resolution of durability issues on the first generation 1999 X5.

EDUCATION

Bachelor of Engineering, Mechanical, The University of Manchester, Manchester, England, United Kingdom, 1995

CONTINUING EDUCATION

Traffic Crash Reconstruction 2, Northwestern University Center for Public Safety, 2023
Traffic Crash Reconstruction 1, Northwestern University Center for Public Safety, 2023
Traffic Crash Investigation 2, Northwestern University Center for Public Safety, 2022
Traffic Crash Investigation 1, Northwestern University Center for Public Safety, 2022
Managing Chaos: Tools to Set Priorities and Make Decisions Under Pressure, AMA, 2016
Operational Leader, HMG, 2015
Speed FMEA, HMG, 2014
Strategic Thinking, AMA, 2014
Successfully Managing People, AMA, 2013
Catia V5 Top Gun, HMG, 2010
Catia V5 R18 Intermediate, HMG, 2009
Catia V5 R18 Fundamentals, HMG, 2009
Introduction to Abaqus Standard and Explicit, Simulia, 2009
HyperForm Introduction, Altair, 2009
Fundamentals of Sheetmetal Formability, Altair, 2009

THE EXPERTS
Robson Forensic

CHRISTOPHER D. ROCHE
Mechanical/Automotive Engineer

Designing FMEA for Systems and Components, DCQI, 2006
Catia V5 Top Gun, Incat, 2005
Catia V4 Basic 3D Design, Incat, 1999
Design Sensitivity and Optimization in MSC/Nastran, MSC, 1998
Presentation Skills, RG, 1997
MSC/Nastran Dynamic Analysis, MSC, 1996
Basic MSC/Nastran Linear and Static Modes Analysis, MSC, 1996
TQ – Managing for Excellence, RLB, 1996
Level 1, Engineering Material Processing, EnTra, 1996
Engineering Material Processing-Power Press Operations, EnTra, 1996
NVQ Level 1 Operating Power Presses – Pre-set, Axis, 1995
Learning About the Environment, Axis, 1995
Personal Development, Teamwork, and Leadership Skills, Skern Lodge, 1995

PROFESSIONAL MEMBERSHIPS

Society of Automotive Engineers (SAE), 2013-2017, 2022-present

PATENTS

U.S. Patent 9,849,914, Front Body Structure of a Vehicle for Enhanced Crash Protection

PAPERS / PRESENTATIONS

Small Overlap Impact Countermeasure-Front Door Hinge Pillar Dual Box, SAE, 2016

ADDITIONAL EXPERIENCE

Competition Race Licenses - expired

- Waterford Hills Road Racing, Inc. (WHRRI): 2000
- Sports Car Club of America (SCCA): 2000
- Motor Sports Association (MSA): 1996 – 1998

Competition Race Titles

SCCA Solo

- Detroit Region Street Tire B Stock Champion 2006 and 2007

SCCA Racing Series

- Central Division Regional Champion – Area 4, SSC, 2000

MGCC

- Anglia Phoenix Class B Champion 1997 and 1998

Christopher D. Roche, Mechanical Engineer
History of Expert Testimony by Deposition or Trial

Date	Case Name & Description
9/25/2023	McCarthy, et al. v. Tesla, Inc. et al. Case No. 19CV358560 / Reams, et al. v. Tesla, Inc. Case No. 19CV355119. *Superior Court of California, County of Santa Clara; Deposition*

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Robson Forensic

October 16, 2023

Tedra L. Cannella, Esq.
Cannella Snyder
315 W. Ponce De Leon Avenue, Suite 885
Decatur, GA 30030
Phone: (404) 800-4828
Email: tedra@cannellasnyder.com

Re: Estate of Cohen Zayne Bryson and Santana and Joshua Bryson v. Rough Country, Inc.
RFI File: 22SC0121

Dear Attorney Cannella:

Our fee schedule for Christopher D. Roche is as follows and applies to all work including preparation, file review, research, analysis, inspections, meetings/phone conferences, reports, depositions, travel, and trial.

Services provided to you will be invoiced at $475.00 per hour. When travel on behalf of your case is required, we will invoice you at full rate from Ann Arbor, MI.

Out-of-pocket expenses will be passed along with a 12% carrying charge. This includes travel costs (mileage, airfare, airport service, accommodations, meals, auto rental, etc.), photocopies, outside lab/testing, data collection/verification and demonstrative aids. You are also responsible for any applicable equipment charges and lab service fees.

Invoices are due upon receipt. After 30 days, balances will accrue 1.5% interest per month. All rates are subject to change.